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What is claimed is :

1. A method of driving a color liquid crystal display in a normal driving mode and a power saving mode,

5 wherein in said normal driving mode, voltages corresponding to image display data are applied to data electrodes of said color liquid crystal display, and

 wherein in said power saving mode, voltages corresponding to highly significant bit signals of said image display data are applied as
10 display data signals to said data electrodes.

2. The method as claimed in claim 1, wherein said power saving mode includes an essential information display mode, where a predetermined uniform voltage level, which corresponds to a
15 predetermined color and which is independent from said image display data, is uniformly applied to all data electrodes on other region than at least a designated region for displaying the essential information.

3. The method as claimed in claim 2, wherein said color liquid
20 crystal display is of normally white type, and said predetermined color is white.

4. The method as claimed in claim 2, wherein said color liquid crystal display is of normally black type, and said predetermined color is

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black.

5. The method as claimed in claim 2, wherein a uniform scanning signal is simultancously applied to all scanning electrodes on other region
5 than said at least designated region for displaying the essential information.

6. The method as claimed in claim 1, wherein at least a full color display region in said color liquid crystal display is displayed in said normal driving mode, and

10 wherein at least a partial color display region in said color liquid crystal display is displayed in said power saving mode.

7. The method as claimed in claim 1, wherein said power saving mode further inactivates a gray scale voltage generating circuit, a polarity
15 selecting circuit, and an output circuit included in a driver circuit for driving said color liquid crystal display.

8. A circuit for driving a color liquid crystal display, comprising :
a data latch for selectively inverting image display data based on
20 a polarity signal ;

a gray scale voltage generating circuit for generating a first set of plural positive-polarity gray scale voltages and a second set of plural negative-polarity gray scale voltages ;

a polarity selecting circuit for selecting one of said first set of

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said plural positive-polarity gray scale voltages and said second set of said plural negative-polarity gray scale voltages based on said polarity signal ;

a gray scale voltage selecting circuit for selecting a single gray scale voltage from said selected plural gray scale voltages based on said image display data supplied from said data latch ;

an output circuit for supplying said selected single gray scale voltage to a corresponding data electrode of said color liquid crystal display ; and

a control circuit for inactivating said gray scale voltage generating circuit, said polarity selecting circuit, and said output circuit in a power saving mode, and also for applying voltages corresponding to highly significant bit signals of said image display data as display data signals to said data electrodes in said power saving mode.

9. The circuit as claimed in claim 8, wherein said polarity signal is selectively inverted for every horizontal synchronizing time periods or for every vertical synchronizing time periods.

10. The circuit as claimed in claim 8, wherein said plural positive-polarity gray scale voltages are predetermined to adjust to a positive voltage to transmittivity characteristic of said color liquid crystal display, and said plural negative-polarity gray scale voltages are also predetermined to adjust to a negative voltage to transmittivity characteristic of said color liquid crystal display.

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11. The circuit as claimed in claim 8, wherein said power saving mode includes an essential information display mode, where said control circuit controls said data latch so that a predetermined uniform voltage level, which corresponds to a predetermined color and which is independent from said image display data, is uniformly applied to all data electrodes on other region than at least a designated region for displaying the essential information.

10 12. The circuit as claimed in claim 11, wherein said color liquid crystal display is of normally white type, and said predetermined color is white.

13. The circuit as claimed in claim 11, wherein said color liquid crystal display is of normally black type, and said predetermined color is black.

14. The circuit as claimed in claim 11, further comprising a scanning electrode driving circuit, wherein said control circuit controls said scanning electrode driving circuit for simultaneously applying a uniform scanning signal to all scanning electrodes on other region than said at least designated region for displaying the essential information.

15. The circuit as claimed in claim 8, wherein at least a full color

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display region in said color liquid crystal display is displayed in said normal driving mode, and

wherein at least a partial color display region in said color liquid crystal display is displayed in said power saving mode.

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16. The circuit as claimed in claim 8, wherein said gray scale voltage generating circuit further comprises : a divided-voltage generating circuit for generating plural divided-voltages different in voltage level from each other in a normal driving mode and also for generating no divided-voltages

10 in said power saving modes.

17. The circuit as claimed in claim 16, wherein said divided-voltage generating circuit further comprises :

a series connection of plural resistances having a uniform
15 resistance value ;

a high voltage side switch for applying a high voltage to a first side of said series connection of plural resistances in said normal driving mode and for applying no voltage to said first side in said power saving mode ; and

20 a low voltage side switch for applying a low voltage to a second side of said series connection of plural resistances in said normal driving mode and for applying no voltage to said second side in said power saving mode.

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18. The circuit as claimed in claim 8, wherein said polarity selecting circuit further comprises :

a first switching group including plural switches for selecting said plural positive-polarity gray scale voltages based on a positive switching signal ; and

a second switching group including plural switches for selecting said plural negative-polarity gray scale voltages based on a negative switching signal.

19. The circuit as claimed in claim 8, wherein said gray scale voltage selecting circuit selects either first one of said plural positive-polarity gray scale voltages or second one of said plural negative-polarity gray scale voltages based on said image display data.

20. The circuit as claimed in claim 19, wherein said output circuit generates an output signal based on said selected gray scale voltage supplied from said gray scale voltage selecting circuit in said normal driving mode, and also said output circuit generates either one of predetermined high and low voltage levels which are independent from said selected gray scale voltage in said power saving mode.

21. The circuit as claimed in claim 20, wherein said output circuit further comprises :

an amplifying circuit for amplifying said selected gray scale

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voltage in said normal driving mode, and also said amplifying circuit being inactivated in said power saving mode ; and

- a selecting circuit for selecting said amplified gray scale voltage supplied from said amplifying circuit in said normal driving mode, and also
- 5 selecting either one of said predetermined high and low voltage levels which are independent from said selected gray scale voltage in said power saving mode.

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21. The circuit as claimed in claim 8, wherein said data latch
- 10 comprises :

a latch circuit for accepting input of said image display data in synchronizing with a strobe signal having the same cycle as a horizontal synchronizing signal and said latch circuit subsequently holding said image display data for a single horizontal synchronizing time period ;

- 15 a level shifter for shifting a voltage level of said image display data supplied from said latch circuit and also inverting said image display data to generate both non-inverted image display data and inverted image display data ; and

- a selector for selecting, based on said polarity signal, said non-
20 inverted image display data or said inverted image display data supplied from said level shifter.

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22. The circuit as claimed in claim 8, wherein said data latch
- comprises :

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a latch circuit for accepting input of said image display data in synchronizing with a strobe signal having the same cycle as a horizontal synchronizing signal and said latch circuit subsequently holding said image display data for a single horizontal synchronizing time period ;

- 5 a first selector for selecting, based on a partial display signal supplied from said control circuit, either monochrome display data supplied from said control circuit or said image display data supplied from said latch circuit ;

- 10 a level shifter for shifting a voltage level of said selected monochrome display data or said image display data supplied from said latch circuit and also inverting said display data to generate either a first pair of non-inverted image display data and inverted image display data or a second pair of non-inverted monochrome display data and inverted monochrome display data ; and

- 15 a second selector for selecting, based on said polarity signal, one of said non-inverted image display data and said inverted image display data or of said non-inverted monochrome display data and said inverted monochrome display data supplied from said level shifter.

- 20 ²⁴
~~23.~~ A portable device including a color liquid crystal display and a driver circuit for driving said color liquid crystal display with a battery power, said driver circuit comprising :

a data latch for selectively inverting image display data based on a polarity signal ;

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a gray scale voltage generating circuit for generating a first set of plural positive-polarity gray scale voltages and a second set of plural negative-polarity gray scale voltages ;

5 a polarity selecting circuit for selecting one of said first set of said plural positive-polarity gray scale voltages and said second set of said plural negative-polarity gray scale voltages based on said polarity signal ;

a gray scale voltage selecting circuit for selecting a single gray scale voltage from said selected plural gray scale voltages based on said image display data supplied from said data latch ;

10 an output circuit for supplying said selected single gray scale voltage to a corresponding data electrode of said color liquid crystal display ; and

a control circuit for inactivating said gray scale voltage generating circuit, said polarity selecting circuit, and said output circuit in a power saving mode, and also for applying voltages corresponding to highly significant bit signals of said image display data as display data signals to said data electrodes in said power saving mode.

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24.

20 The portable device as claimed in claim ~~23~~²⁴, wherein said polarity signal is selectively inverted for every horizontal synchronizing time periods or for every vertical synchronizing time periods.

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25.

The portable device as claimed in claim ~~23~~²⁴, wherein said plural positive-polarity gray scale voltages are predetermined to adjust to a

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positive voltage to transmittivity characteristic of said color liquid crystal display, and said plural negative-polarity gray scale voltages are also predetermined to adjust to a negative voltage to transmittivity characteristic of said color liquid crystal display.

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~~26~~²⁷

The portable device as claimed in claim ~~23~~²⁴, wherein said power saving mode includes an essential information display mode, where said control circuit controls said data latch so that a predetermined uniform voltage level, which corresponds to a predetermined color and which is independent from said image display data, is uniformly applied to all data electrodes on other region than at least a designated region for displaying the essential information.

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The portable device as claimed in claim ~~28~~²⁷, wherein said color liquid crystal display is of normally white type, and said predetermined color is white.

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The portable device as claimed in claim ~~26~~²⁷, wherein said color liquid crystal display is of normally black type, and said predetermined color is black.

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The portable device as claimed in claim ~~26~~²⁷, further comprising a scanning electrode driving circuit, wherein said control circuit controls said scanning electrode driving circuit for simultaneously applying a uniform

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scanning signal to all scanning electrodes on other region than said at least designated region for displaying the essential information.

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30. The portable device as claimed in claim ²⁴~~23~~, wherein at least a full
5 color display region in said color liquid crystal display is displayed in said normal driving mode, and

wherein at least a partial color display region in said color liquid crystal display is displayed in said power saving mode.

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10 31. The portable device as claimed in claim ²⁴~~23~~, wherein said gray scale voltage generating circuit further comprises : a divided-voltage generating circuit for generating plural divided-voltages different in voltage level from each other in a normal driving mode and also for generating no divided-voltages in said power saving modes.

- 15 33
32. The portable device as claimed in claim ³²~~31~~, wherein said divided-voltage generating circuit further comprises :

a series connection of plural resistances having a uniform resistance value ;

- 20 a high voltage side switch for applying a high voltage to a first side of said series connection of plural resistances in said normal driving mode and for applying no voltage to said first side in said power saving mode ; and

a low voltage side switch for applying a low voltage to a second

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side of said series connection of plural resistances in said normal driving mode and for applying no voltage to said second side in said power saving mode.

5 ³⁴~~33~~. The portable device as claimed in claim ²⁴~~23~~, wherein said polarity selecting circuit further comprises :

a first switching group including plural switches for selecting said plural positive-polarity gray scale voltages based on a positive switching signal ; and

10 a second switching group including plural switches for selecting said plural negative-polarity gray scale voltages based on a negative switching signal.

³⁵~~34~~. The portable device as claimed in claim ²⁴~~23~~, wherein said gray scale voltage selecting circuit selects either first one of said plural positive-polarity gray scale voltages or second one of said plural negative-polarity gray scale voltages based on said image display data.

³⁶~~35~~. The portable device as claimed in claim ²⁵~~34~~, wherein said output circuit generates an output signal based on said selected gray scale voltage supplied from said gray scale voltage selecting circuit in said normal driving mode, and also said output circuit generates either one of predetermined high and low voltage levels which are independent from said selected gray scale voltage in said power saving mode.

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The portable device as claimed in claim ~~35~~³⁶, wherein said output circuit further comprises :

- an amplifying circuit for amplifying said selected gray scale voltage in said normal driving mode, and also said amplifying circuit being inactivated in said power saving mode ; and

- a selecting circuit for selecting said amplified gray scale voltage supplied from said amplifying circuit in said normal driving mode, and also selecting either one of said predetermined high and low voltage levels which are independent from said selected gray scale voltage in said power saving mode.

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37.

The portable device as claimed in claim ~~23~~²⁴, wherein said data latch comprises :

- a latch circuit for accepting input of said image display data in synchronizing with a strobe signal having the same cycle as a horizontal synchronizing signal and said latch circuit subsequently holding said image display data for a single horizontal synchronizing time period ;

- a level shifter for shifting a voltage level of said image display data supplied from said latch circuit and also inverting said image display data to generate both non-inverted image display data and inverted image display data ; and

- a selector for selecting, based on said polarity signal, said non-inverted image display data or said inverted image display data supplied

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from said level shifter.

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~~38~~. The portable device as claimed in claim ²⁴~~23~~, wherein said data latch comprises :

5 a latch circuit for accepting input of said image display data in synchronizing with a strobe signal having the same cycle as a horizontal synchronizing signal and said latch circuit subsequently holding said image display data for a single horizontal synchronizing time period ;

 a first selector for selecting, based on a partial display signal
10 supplied from said control circuit, either monochrome display data supplied from said control circuit or said image display data supplied from said latch circuit ;

 a level shifter for shifting a voltage level of said selected monochrome display data or said image display data supplied from said
15 latch circuit and also inverting said display data to generate either a first pair of non-inverted image display data and inverted image display data or a second pair of non-inverted monochrome display data and inverted monochrome display data ; and

 a second selector for selecting, based on said polarity signal, one of
20 said non-inverted image display data and said inverted image display data or of said non-inverted monochrome display data and said inverted monochrome display data supplied from said level shifter.

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